

IBM

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IBM

magnetic tape



testing

introduction

From its beginnings at the start of this century, magnetic tape has become a reliable and high-speed medium for handling information on modern data processing systems. By keeping pace with the lightning-fast rate of electronic computations, this sophisticated and highly efficient ribbon of memory allows each component of the system to function at top speed.

Both recording and reading of information are accomplished by passing magnetic tape over the face of a read-write head in the magnetic tape unit. To do this, the tape is divided into seven parallel bands or "channels" along its length. By proper positioning of the tape itself, each channel is correctly aligned for recording and reading.

Data is recorded by creating selected combinations of closely spaced magnetic "spots" or "bits" on the surface of the tape. For reading, the process is reversed. The presence of bits in certain channels induces pulses in the read-write head. These pulses are amplified and interpreted as characters of information—numbers, letters, or special symbols.

Neither channels nor bits are visible. It is interesting to note that the magnetic bits can be recognized by a reading device, but cannot be rubbed off. They are not changed by reading information and can be read over and over without any loss in accuracy. Also, the tape can be electronically erased and new information recorded many times.

Combinations of bits can be compared to the combinations of punched holes used to represent data in columns of an IBM Card. Although slightly different codes are used for tape, the idea of recording information according to an established code of combinations is the same.

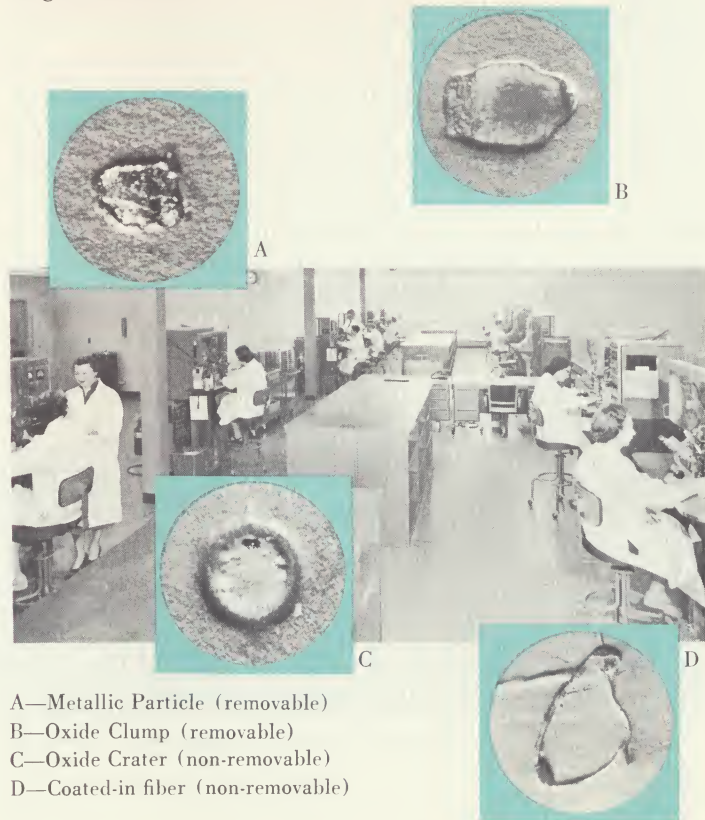


Missing oxide—another kind of imperfection—would cause the same loss of information by preventing the proper original recording. Foreign particles and physical defects also may generate noise pulses which might be interpreted by the computer as recorded information.

Other irregularities can also prevent proper performance. Tapes must meet width specifications for the channels to be properly guided into position over the read-write head. Furthermore, tapes whose magnetic properties fluctuate from the norm can produce signal errors.

It is to eliminate such defects that the numerous tests and inspections are performed at the Tape Center. If a defect is not removable, the tape is rejected. Only perfect tape is shipped to customers.

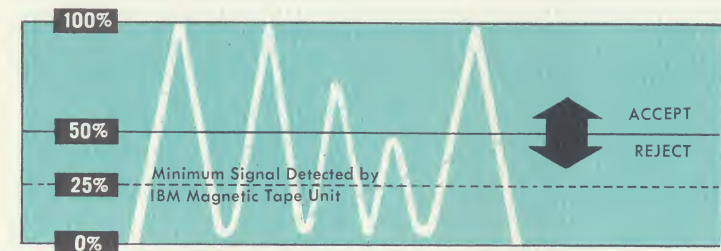
Typical imperfections found in tape are pictured below in magnified form:



signal test

Every inch of tape receives a signal test on specially constructed electronic tape-testing machines. All seven channels are completely written over their entire length. Then, all recorded bits are read back under conditions much more severe than any likely to be encountered in a customer's IBM installation.

In this manner, individual bits are read back to insure that they have produced a signal whose strength is at least 50 percent of the maximum possible signal.



If any one of the more than 40 million recorded bits does not give a proper read signal, the tape testing machine automatically stops. The area of the tape involved is scanned by an inspector with a microscope to locate and remove the defect which prevented the signal from being read correctly.

If a defect such as a "clump" of oxide is removable, the inspector lifts it from the surface of the tape using special techniques developed by the Tape Center. This operation requires the surgeon's touch lest the tape itself be damaged.

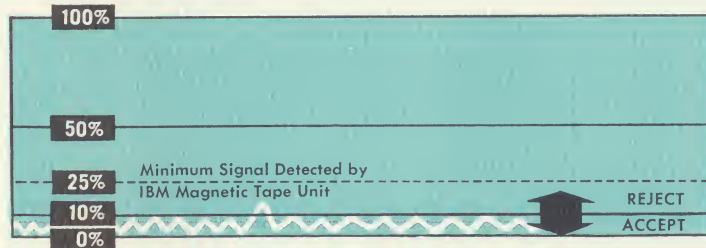
After removal of the interfering defect, that area of the tape is retested. If even one bit signal still gives a signal less than 50 percent of the maximum, the entire tape is rejected.

noise test

In addition to the signal test, each tape also receives a complete noise test. Theoretically, of course, no read signals should be detected during this test. The faint pattern of noise or background pulses normally cannot be detected by a tape unit and

does not interfere with the accuracy of tape operations.

For the noise test, the tape is first erased electronically and then read. If any signal is produced, it must be a "noise" or false signal. Even one noise pulse greater than 10 percent of the maximum read signal will cause the tape to be rejected.



The signal and noise tests have been designed to insure that each bit will be faithfully read once recorded and that no noise signals will register false information.

IBM Magnetic Tape Units are engineered to read any signal greater than 25 percent of maximum strength. Consequently, IBM tolerances for tested tape establish a 100 percent safety factor against weak read signals and a 150 percent safety factor against noise.

other tests

Consistency of magnetic response or "magnetic efficiency" is another factor with which the Tape Center is vitally concerned. A slight variation in electrical output is expected, but a writing signal of a particular strength should produce bits whose read signals will vary only slightly in strength from tape to tape.

To insure consistency of electrical output, each lot of tape is carefully tested by comparison to a standard tape. The electrical output of individual tape reels must come within 5 percent of that of the standard tape.

Each lot of tape is also given a quality control check for width, thickness and tensile strength. Of course, these important physical characteristics must conform to very rigid specifications in order for the tape to be accepted.

Complete records of tests performed on each reel and the corresponding results are maintained in a history file should future reference be necessary.

After the tape has been completely tested, the correct length is verified electronically and metal reflector strips are affixed at the lead and tail ends of the tape. The presence and proper positioning of these markers are tested electronically. Although the IBM Magnetic Tape Unit will stop on sensing one of these metal strips, the remainder of the tape is also completely tested.

general operations

Extending quality control into every step of its operations, extreme care is used in the cleaning, handling, inspection and testing of all components of the complete Magnetic Tape Reel Assembly.

All items such as reels, file protect rings, plastic cannisters and flexible plastic envelopes are subjected to a thorough quality control inspection when they are received at the Center.

Since foreign particles from the atmosphere could contaminate tape, all tests are performed in areas which are carefully air conditioned and humidity controlled. The air in these areas is completely dust filtered by both mechanical and electrostatic filtering devices to insure that the tape is handled only under the cleanest possible conditions. All personnel in these areas wear lint-free smocks to eliminate any possibility of contamination from clothing dust or fibers.

shipping procedures

After all tests have been completed, each accepted reel of tape is given a final visual inspection and a thorough cleaning by a powerful vacuum. It is then placed in a plastic cannister which has been thoroughly cleaned. This cannister, in turn, is sealed within a plastic envelope. The plastic envelope not only seals out dust, but helps to maintain the proper humidity conditions for the tape during shipment.

The sealed assembly is then placed in a heavy corrugated board wrapper and packed five or ten to a specially designed corrugated shipping container. This container is equipped with a quick-opening tear strip to permit easy opening of the container without the use of tools.

retest service

In addition to its regular testing operations, the Magnetic Tape Center also offers a Retest Service for used IBM Magnetic Tape returned by customers.

This service provides for the complete retesting of each reel of tape. All foreign material accumulated on the tape through use is removed if possible. If permanent or non-removable defects have been created during use, they are either marked on the tape, or the longest perfect length of tape is cut from the reel as specified by the customer.

A report showing either the location of non-removable errors, or the length of the longest perfect section of tape, accompanies the reel on its return to the customer.

in summary

All testing conducted at the IBM Magnetic Tape Center has just one purpose—to protect the IBM customer. When properly used with a computing system, fully-tested IBM Magnetic Tape is an indispensable ingredient of accurate, reliable, and economical data processing.

